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ABSTRACT

Alumni surveys were sent to one-year alumni from a large, public research university to determine the survey format that resulted in the best response rates and the least response bias. Surveys differed in whether they were check-box or machine-scannable (optical mark recognition, or OMR) and in whether it was possible to use a Web site to complete the survey or just the paper form. Surveys were sent to 4,952 bachelor's degree recipients in four groups: (1) OMR with a Web option; (2) OMR with no Web option; (3) check-box with a Web option; and (4) check-box with no Web option. The final sample size was 4,524. Overall, 33.9% of the alumni responded over 3 months, with the group receiving the check-box plus Web option having the highest response rate (35.7%), followed by the check-box with no Web option (35.7%), the OMR with Web option (33.0%), and finally the OMR with no Web option (32.3%). Only 2% overall actually responded over the Internet. Optically machine-readable forms tended to suppress the response rates. Nonresponse bias for subgroups did not appear to be a problem, but there was some evidence of possible negative response bias in question answers, with respondents receiving the check box tended to give more negative answers than respondents receiving an OMR survey. (Contains 1 figure, 5 tables, and 16 references.) (SLD)

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Paper presented at the 41st Forum of the Association of Institutional Research,
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What Works Best? Collecting Alumni Data with Multiple Technologies

Abstract

We present results from an experiment in which alumni surveys were sent to one-year alumni of a large, public research university divided into four groups that differed by 1) whether they received a check-box or machine-scannable survey form and 2) whether they were told of a website where the survey could be filled out instead of using their paper form. We analyze the data to determine which of the four approaches was most effective in terms of response rates and response bias.

What Works Best? Collecting Alumni Data with Multiple Technologies

Introduction

Alumni survey data have grown increasingly important for institutions of higher education. In the state of Maryland, for example, the proportion of alumni expressing satisfaction with their alma mater is now used by the legislature as a budget-based accountability measure. The results from alumni surveys are also being used in enrollment management (Claggett & Kerr, 1993; Haugen & Dallam, 1992), and for many years have been employed by advancement offices to inform fundraising and predict alumni donor behavior (Okunade, 1993; Taylor & Martin, 1995).

But as the use of student and alumni data have increased, response rates to surveys have been falling nationally (Dey, 1997; Steeh, 1981). Survey fatigue is most commonly cited, as public opinion polls have become more popular with the media, and telemarketers have increasingly used surveys to develop data for data mining research. Informal surveys of colleagues in institutional research also indicate that response rates for student and alumni surveys have also been falling. As an example, the Alumni Survey at the University of Maryland, College Park, generated response rates above 50% in the previous decade; in 1998 the response rate was only 22%.

The result is that as response rates continue to shrink, educational researchers face increasing costs of to counter survey non-response. Second and third mailings, for example, must be larger if the initial mailing elicits a weak response pool. Researchers must refine their data collection tools to counter this growing trend.

Unfortunately research into improving alumni survey data has remained limited (e.g. Boser, 1990; Cote at al., 1986; Grosset, 1995; Smith & Bers, 1987) and appears to have tapered off since the 1980's. While many institutional researchers have relied on general survey research results to inform their efforts (for example, the outstanding work by Dillman (2000)), most of this research has been based on surveys of the general population. Yet alumni are certainly a special subpopulation of their own. For example, while one of the most effective ways to increase response rates is to include a $1 bill with survey forms (Church 1993; Warriner et al., 1996), such "wasteful" spending would probably produce a backlash among alumni on whom it was used.

In an effort to fill the gap in the literature on increasing alumni survey response rates, we conducted an experiment with an alumni survey at a large, public research university by dividing the sample into four groups and alternating the survey method. Alumni received either a regular check-box survey or a machine-scannable survey form, and some alumni were informed of the possibility of filling out the survey on a website. These four groups allow us to test the possibility that machine-scannable forms may suppress response rates, a still contentious point in the literature (Dillman and Miller 1998), and to also understand the impact of allowing alumni to answer via the Internet. We then analyze the results in terms of response rates and response bias.

Multiple technologies for survey research

Machine-readable forms

One of the most popular technologies for the collection of survey data in higher education is optical mark recognition (OMR) forms, the ubiquitous "bubble" or "Scantron" survey forms. These surveys have specifically defined areas that a machine can read, and determine the

presence or absence of a mark in an area. (Note that these differ from the new optical character recognition (OCR) forms, which can appear just like a regular paper survey. Optical scanners read the form and can determine not only the presence or absence of marks, but also can read written characters. Although OCR forms hold great promise for surveys in higher education, the most common technology by far is OMR, and given the investments many institutions have in OMR equipment and forms, it will likely remain that way for the near future. The impact of OMR forms on response rates is still a very relevant issue.

OMR surveys allow fast processing of individual surveys. To an extent they can also save money on data entry, which can then allow additional mailings through cost savings. The main alternative to OMR surveys is the standard paper survey with check-boxes and fill-in-the-blanks. The drawback to these surveys, is that the data must be hand-entered, while OMR surveys can be read by a machine that will produce a finished dataset.

One possible disadvantage with OMR surveys is that they may suppress response rates. In their review of 44 OMR surveys Dillman and Miller (1998) found mixed support for this hypothesis. Suppression of response rates can occur for several reasons. OMR surveys are often combined with other cost-cutting measures (e.g., no followup), so their low response rates may simply be an artifact of other choices about survey administration (Dillman, 2000 p.418). Generally OMR forms have one standard ink color that provides limited visual appeal (Dillman, 2000 p.418), creating a disincentive for response. And our own experience and conversations with students indicate that these forms are also more tedious to fill out. Rather than simply reading through the survey and checking off or circling responses, the respondent must carefully fill in a circle or "bubble" for each question.

Besides response rates there may be additional data quality issues with OMR surveys. First, given the difficulty of filling out OMR surveys, item non-response may be higher than standard check-box surveys, especially when the respondent is confronted with large banks of similar questions. Second, there may be potential response bias among subgroups of respondents, as the "technical" appearance of OMR surveys may have a differential effect across demographic groups or those respondents less comfortable with technology.

Web surveys

Conducting surveys over the Internet has become increasingly popular, as web surveys have no printing costs, can be conducted in a far shorter time span than mail surveys, require no data entry, and produce an analyzable dataset. There are a large variety of issues involving web surveys, such as response bias and cost effectiveness (for an excellent review see Couper, 2000), but one area has been little investigated: how successful are web surveys that are not conducted by email?

Usually web surveys are conducted via email, in which an email is sent to each respondent with an embedded link to the survey website (or alternatively, respondents at their computer reading email copy the URL of the website into their browse to access the survey). The barrier to response is quite low with this approach, as the respondent has to simply click a few buttons to begin the survey. The problem, of course, is that the researcher must have valid email addresses for the sample. For enrolled students or faculty and staff, these can be quite easy to procure. For alumni, however, valid email addresses can be difficult to obtain, and are almost impossible to obtain for a random sample of alumni (generally development offices only have

email addresses for alumni who volunteer them, or who have signed up for lifetime alumni email addresses).

The only alternative for using web surveys with alumni is to send them the URL of the website in a letter. The barrier to response, however, is now quite substantial, as the alumnus must go to the computer and turn it on before typing the URL into the web browser to access the survey. Research indicates that this may not be an effective way of administering web surveys. In three different paper surveys sent to enrolled students who were also offered the option to respond via the web, the proportion choosing to use the web survey varied only from 7%-15% (Tomsic et al., 2000). Such small proportion suggests that such web surveys may not be an effective method for collecting survey data from alumni.

Sample and Design

We employed an experimental design in a survey of one-year alumnae to understand differences between response rates using an optical mark recognition form, a standard check-box paper form, and a web form. The survey itself contained over eighty questions and was 4 pages long. The questions covered such topic areas as current employment status, satisfaction with various aspects of the institution, and self-assessed growth of skills and abilities (see the Appendix).

All 4,952 bachelor's degree recipients for fiscal year 1999 were randomly assigned to four different groups of survey administration types: OMR form with a web option, OMR form with no web option, check-box form with a web option, and check-box form with no web option (see Table 1). Only the two OMR groups received machine-readable paper forms, but in all of their mailings the web option group was given an Internet URL for the web version of the

survey, giving them the opportunity to fill out the survey online. The check-box groups were mailed only the standard check-box paper forms, with the web option group also receiving the website address for the online version of the survey. Taking into account bad addresses, the final sample size was 4,524.

This experimental grouping allows us to compare the impact of OMR surveys on response rates, as well as test how effective web surveys can be in collecting information from alumni.

Procedure

We employed the Dillman (1986, 2000) method of mail surveying in an effort to obtain high response rates. Dillman's method involves multiple contacts with respondents when doing large-scale mail surveys, using a pre-notification contact and multiple survey mailings and reminder contacts.

During the second week in June 2000, a pre-notification postcard was mailed to all fiscal year 1999 graduates. The postcard explained the forthcoming survey and the importance of their participation. We included a website address to the two web option groups and offered them the opportunity to fill the survey out online.

Approximately two weeks later the survey was mailed to the entire sample. Included in the mailing were a self-addressed, stamped envelope and a cover letter explaining the purpose of the survey and the importance of their participation. Half of the group received the OMR survey, and the other half the check-box survey. Again, we included a website address in the letters sent to the two web groups.

Two weeks after the first survey mailing we mailed a reminder postcard to the entire sample. The postcard encouraged the graduates to fill out the survey if they had not already done so and thanked them if they had. A website address was included on the postcard for the members of the two web groups.

Roughly four weeks after the reminder postcard mailing, we mailed a second survey to all non-respondents. The mailing was similar to the first mailing and included a self-addressed stamped envelope and a cover letter. Web groups were again given the web address for the on-line version of the survey.

Two weeks after the second survey mailing, we sent a final reminder postcard. The postcard encouraged students to fill out the survey if they had not already done so. Included in all of the postcards was the web address of the online survey telling them this was their last chance to participate.

Because of the complicated and costly nature of the survey we were not able to employ some of the techniques suggested by Dillman to increase response rates. We did not personalize the letters as Dillman suggests nor did we have someone actually sign the letters. We were also unable to secure the signature of the president, so the Provost's scanned signature was included on the letters.

Analysis

Our analysis of the data focuses on three areas:

- How do the response rates vary for each administration group?
- How does the survey methodology affect the respondent pool?
- How does the survey methodology affect question responses?

Response rates

Table 2 presents the number of respondents and response rates each of the four experimental groups, the combined response rates for check-box versus OMR surveys and web versus no web option, and the total response rate. Overall 33.9% of the alumni responded to the survey over the three-month period. Examination of the response rates for the four groups reveals that the check-box group that was offered the web option had the highest response rate (35.7%, followed by the check-box group with no web option (34.5%), the OMR group offered a web option (33.0%) and finally, the OMR group given no web option (32.3%). These response rates differ as expected, with the check-box/web option group having the highest response rate, but the differences are not statistically significant.

A comparison of the combined response rates also reveals expected differences in response rates. Combining the two web option / no web option groups, the response rates differ as expected, with the response rate for the total web option group, 34.3%, slightly higher than the response rate for the no web option group, 33.4%. This difference is not statistically significant.

Combining the two check-box groups and two OMR groups, we can see that the response rates of the two combined groups differ by 2.4 percentage points (35.1% versus 32.7%, see the far right column in Table 2). This difference in statistically significant with a one-tailed test ($p<.043$). The OMR form does appear to suppress response in comparison to the check-box form, although the substantive difference is not very large.

From a comparison of response rates it seems that the machine-scannable forms tended to suppress response rates, while the ability to respond via the web had not significant impact. Where exactly in the survey administration did this effect occur? Dillman (2000) asserts that

much of the literature finding differential responses rates for OMR and check-box surveys is due to limited survey administration, and that repeated contacts with respondents should minimize these differential response rates. Figure 1 presents the cumulative response rates for the two combined experimental groups, those respondents receiving a check-box survey and those receiving an OMR survey. As can be seen, the 2.4 percentage point difference in response rates occurs in the *latter* part of the survey administration, not at the beginning. In fact, the response rates for the two groups are indistinguishable until after the second mailing, which occurred after the fourth week.

We can offer an alternative explanation to Dillman's scenario of respondents' reactions to OMR surveys. With any survey the willingness of people in the sample to participate will vary. During the beginning of the survey administration people who are very willing to participate will tend to respond regardless of the type of survey. As the number of survey contacts grows, people who are less willing to participate are convinced by the multiple contacts to participate, but just barely. Since many of these people are "on the knife's edge" in terms of commitment to participate, any aspect of the survey methodology that might affect response will tend to have an impact. Thus the impact of OMR surveys on survey response will occur not at the beginning of a survey, but after the second contact.

If this is indeed the case, the conclusion for institutional researchers on a budget is that the use of OMR forms will not have an impact if a planned survey will only consist of one mailing. But if the researcher plans a full tailored design survey administration with multiple contacts, based on our results a check-box survey would yield a higher response rate.

Web option

Disappointingly, very few alumni chose to fill out the survey over the web. Of the 1,532 respondents in our sample, only 2% (36) chose to respond via the Internet. This proportion is much smaller than those reported by Tomsic et al. (2000). Unlike enrolled students, who generally have easy access to computers on campus, alumni may not have easy access to a computer, and thus our proportion is much smaller than those reported by Tomsic et al. for their enrolled student surveys. Also, the significant amount of effort required of the respondent when the URL is included in a letter (rather than embedded in an email) may prevent them from responding via the web.

Make-up of respondents

Although the preceding analysis only found significantly different response rates for the check-box versus OMR survey groups, even if the experimental groups have similar response rates, the make-up of the respondent pools could differ. Although we are most often concerned about response rates when discussing surveys, a related but often ignored phenomena is response bias. Respondent pools can differ from the original sample both in terms of demographics as well as attitudes. In this case we are interested if there is response bias *between* the experimental groups. In other words, do certain types of survey methods result in respondent pools that are over- or under-represented in terms of race, gender, or some other respondent attribute?

Table 3 presents the results of our analysis of response bias by survey group type. The first four columns of numbers present the proportions or mean values for the attributes listed on the left: proportion female, Asian-American, African-American, and Latino, mean age, cumulative grade point average and proportion with a "hard" major. We derived "hard" major

by collapsing Biglan's (1973) disciplinary categories into two groups – hard and soft. Hard majors include disciplines from life sciences, physical sciences, agriculture, mathematics and engineering. Soft majors include disciplines from the arts, humanities, education, business and the social sciences. Two-way ANOVAs testing for significant differences in these variables across the main grouping of check-box/OMB and web/no web option (i.e., main effects) as well as for significant differences among the four experimental groups (i.e., interaction effects) yielded only one statistically significant difference, the proportion of females in the respondents pools for the four experimental groups.

The proportions for each group do not differ in any expected fashion. For example, for respondents receiving an OMR survey, the web option group had a higher proportion of females than the no web option group. But for respondents receiving a check-box survey, the proportion of females was higher for the no web option group than the web option group. It is likely that this is simply a false positive: with a p-level of .05, we would expect at least one out of twenty statistical tests to yield a significant result, when in the population there is no difference. In the table we conducted 21 different statistical tests looking for differences in the respondent pools, so one statistically significant result is not surprising. The conclusion is that the type of survey methodology used does not affect the makeup of the respondent pool.

Question responses

Although the method of administration does not appear to effect who answers a survey, it may have an impact on what they decide to say. Or, the respondent pools may appear similar in terms of demographics, but differ in terms of the attitudes that respondents have. We test for these possibilities in two ways by analyzing responses to 69 different questions on the survey.

These questions focus on six different areas, with some example listed for each area (see the Appendix for copies of the survey instrument):

- General (e.g., questions covering employment and residence)
- Satisfaction with aspects of the institution (e.g., proud to have graduated from institution, institution has strong reputation)
- Skills and abilities – importance for success (e.g., writing effectively, thinking creatively)
- Skills and abilities – enhanced by institution
- Institutional assistance – obtaining job (e.g., course work, Career Center)
- Institutional assistance – acceptance to graduate school

Given that the previous analyses found only a significant difference between check-box and OMR surveys, we only test for main effects; that is, differences between the check-box and OMR survey groups.

We test for two different possibilities. First, do responses to each question differ by type of survey administered? Second, does the probability of a respondent not answering a question differ by type of survey administration?

Table 4 lists the significant differences found between the two survey groups when comparing question answers. Using each of the 69 question responses as the dependent variable, and including several control variables in an ordinal or dichotomous logistic regression equation, depending on the structure of the dependent variable, we tested for differences in responses between the two survey groups. The control variables were gender, ethnicity, age, transfer student status, cumulative GPA, time to degree, and "hard" major. We included two dummy variables to test for differences in survey administration, one indicating the respondent had

received a check-box survey, and the other indicating the respondent had been notified of the web option for filling out the survey.

The table lists the six sections of questions from the survey, and if a significant difference in question answers was found, the question wording is presented. In addition, the direction of the effect of the survey method is given, as well as the p-level of the significant finding.

Altogether 69 differences were tested, and given a .10 error level we would expect to find about 7 erroneous statistically significant results. We found 5 statistically significant results, so the results presented in Table 4 conform to the view that there were no significant differences in question response between survey groups. What is striking, however, is that the directions of impact are fairly consistent. If these significant results were simply the result of random error, we would expect to find an equal proportion of positive and negative findings. Since this is not the case, the implication is that perhaps there are some significant differences between the two groups.

We can see that the impact of the check-box method versus the OMR method is negative; that is, respondents in the check-box experimental groups tended to on average be less satisfied with aspects of the institution, and give lower ratings on skills assessments. This may be due to the differential response rates between the two groups. If the probability of survey response is related to alumni satisfaction (Schiltz, 1988), and the ease of use of check-box surveys encourages response, then check-box surveys may have a greater chance of inducing less satisfied alumni to respond.

Table 5 presents the mean item non-response for the six groups of questions on the survey for the check-box and OMR survey groups. For each respondent, we counted the number of questions that were left blank, and then took the average for of this number for each of the six

groups of questions on the survey. As can be seen, for five out of the six groups the OMR survey group had a larger number of blank questions than the check-box group. The differences were largest for the skills assessment questions; on average, respondents in the OMR groups left almost twice as many questions blank as the check-box group. Interestingly, the skills assessment questions are one of the largest battery of questions on the survey. We would expect item non-response to be largest here, as some OMR respondents confronted with filling out numerous circles in this section simply begin to pick and choose which questions to answer, or simply skip the section altogether.

The results in Table 5 may provide an explanation for the consistently negative direction found in Table 4. If respondents with negative attitudes towards the institution are less likely to want to spend time on a survey, in an OMR survey situation they would also be more likely to leave questions blank. If the same type of respondents answered these questions on the check-box survey, then the overall results for the check-box group would be more negative than the OMR group. If so, the use of OMR surveys may skew results in a positive direction compared with check-box surveys.

Conclusion

In our survey experiment on one-year alumni, we found that optically machine-readable forms such as Scantron tend to suppress response rates. In our sample the difference in response rates between the check-box and OMR surveys groups was 2.4%. Interestingly, this entire difference occurred only after the second mailing. For institutional researchers on a budget, this finding means that OMR surveys can be used in single mailing surveys without having an impact of response rates. For more standard Dillman-like multiple contact survey administrations, the

researcher should consider the advantages and disadvantages of the OMR survey when choosing a survey instrument.

The opportunity to answer the survey over the web when notified via snail-mail did not appear very attractive to the alumni in our study. Only 3% chose to respond this way, indicating that collecting alumni data in this manner may not be very effective.

We found no differences in respondent pools for the four experimental groups, indicating that non-response bias for subgroups is generally not a problem when using OMR surveys. There was some evidence of possible negative response bias in question answers, with respondents receiving a check-box survey tending to give more negative answers than respondents receiving an OMR survey. However, our results here are inconclusive, and further research is needed in this area.

We did find significantly higher item non-response higher for the OMR survey group, especially for batteries of questions similar in appearance. This is of some concern, as many assessment programs use OMR surveys with batteries of questions such as the skills assessment questions used in our study. In future research we intend to investigate the impact this item non-response may have on assessment results.

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Table 1. Alumni Survey Control and Treatment Groups

Group	Form type	Web notification?	N
1 (control)	Check-box	No	1,120
2	Check-box	Yes	1,138
3	Machine-scannable	No	1,132
4	Machine-scannable	Yes	1,134
Total			4,524

Table 2. Response Rates by Survey Method Type

Experimental group		Group offered option to respond via the web? No	Yes	Total
Check-box	Respondent N	386	406	792
	Non-respondent N	734	732	1,466
	Sample N	1,120	1,138	2,258
	Response rate	**34.5%**	**35.7%**	**35.1%**
OMR	Respondent N	366	374	740
	Non-respondent N	766	760	1,526
	Sample N	1,132	1,134	2,266
	Response rate	**32.3%**	**33.0%**	**32.7%**
Total	Respondent N	752	780	1,532
	Non-respondent N	1,500	1,492	2,992
	Sample N	2,252	2,272	4,524
	Response rate	**33.4%**	**34.3%**	**33.9%**

Table 3. Makeup of Respondent Pool by Survey Method Type

	Survey methodology				Significant differences (p-value)		
	Check-box		OMR		Check-box vs OMR	Web option vs no web option	Interaction
	No web	Web	No web	Web			
% Female	.59	.56	.55	.61	.713	.649	.049*
% Asian	.14	.12	.14	.12	.952	.301	.827
% Black	.10	.12	.09	.14	.823	.051	.284
% Latino	.05	.05	.03	.06	.668	.295	.283
Mean age	25.25	25.29	25.52	25.21	.664	.550	.426
Mean cum. GPA	3.11	3.08	3.14	3.12	.196	.344	.703
% "Hard" major	.32	.33	.32	.29	.425	.748	.346

Note: * $p<.05$; significance tested with two-way ANOVA using main and interaction effects.

Table 4. Impact of Survey Method on Item Responses

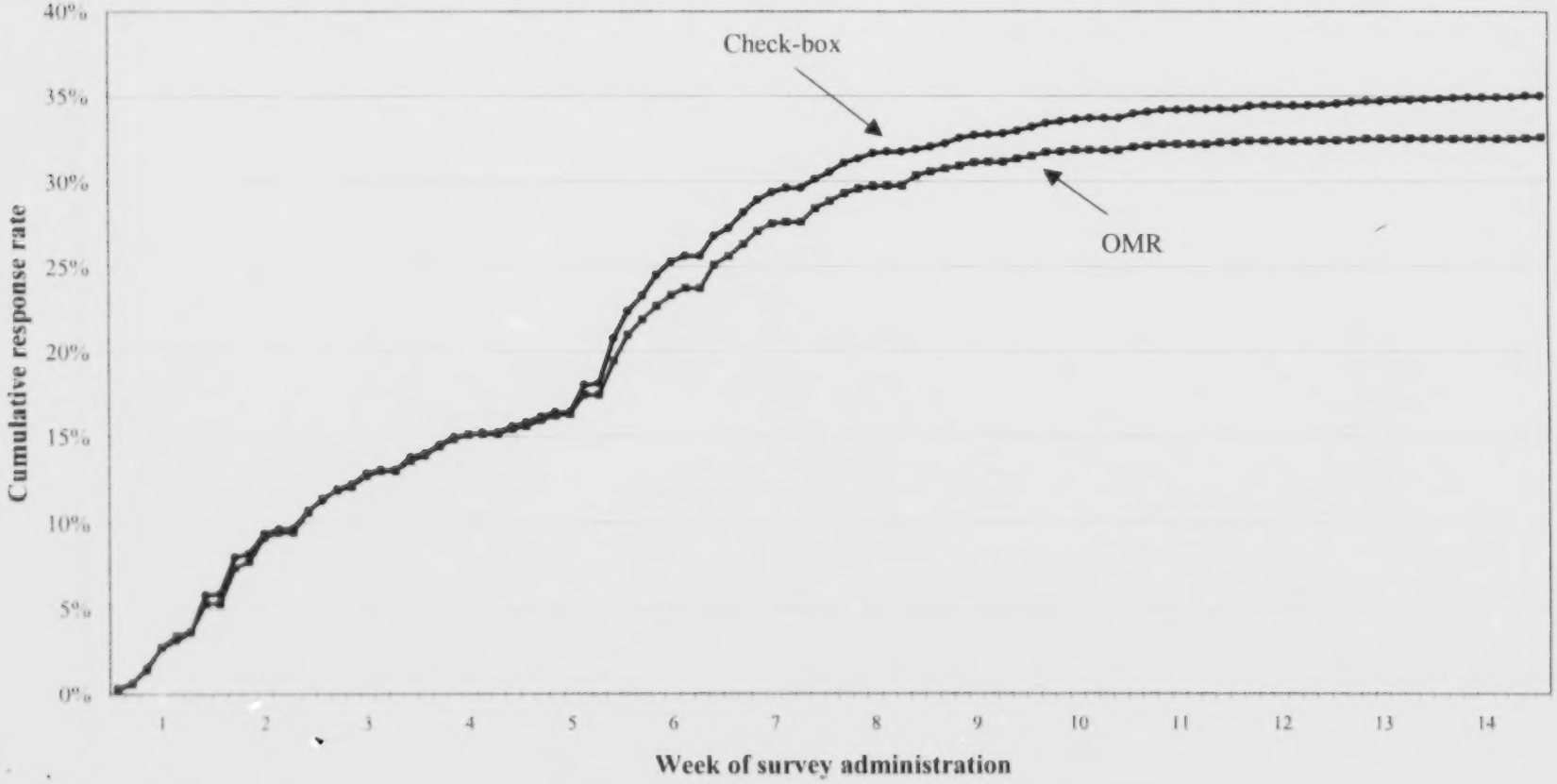
	Impact of check-box method	
Section / question	Direction	P-value
General questions		
To what extent is your current job related to your major or area of study at UM?		
Satisfaction with aspects of institution		
I am proud to tell others I graduated from UM.	Negative	.037
I give UM high ratings when it comes to its reputation in the academic world.	Negative	.044
Skills and abilities - importance for success		
Thinking creatively	Negative	.091
Processing & interpreting numerical data		
Teamwork	Negative	.034
Skills and abilities - enhanced by institution		
Thinking creatively		
Professional ethics		
Understanding the nature of science & experimentation		
Institutional assistance - obtaining job		
Course work in my major field	Negative	.045
Institutional assistance - acceptance to graduate school		

Table 5. Item Non-Response for Check-Box and OMR Survey Methods

Section	Number of items	Mean item non-response		
		Check-box	OMR	Difference
General questions	11	2.5	3.0	0.5 **
Satisfaction with aspects of institution	10	1.6	2.2	0.6 **
Skills and abilities - importance for success	13	1.4	2.7	1.4 **
Skills and abilities - enhanced by institution	13	1.2	2.2	1.0 **
Institutional assistance - obtaining job	11	5.2	5.6	0.4 *
Institutional assistance - acceptance to graduate school	11	8.5	8.5	0.0
Total	69	20.4	24.3	3.9 **

Note: Means have been rounded; $p < .01$ **, $p < .05$ *; significance tested with two-way ANOVA.

Figure 1. Cumulative Response Rates by Survey Type Over Time



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